

# High Density Vehicle-Bear Collision Locations and Potential Mitigation Measures: Identifying Existing Bridges as Potential Wildlife Underpasses



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## **Introduction**

Since 2012, over 230 vehicle-bear collisions have occurred each year as both the bear and human populations continue to grow and expand in Florida. According to the United States Census Bureau, Florida became the third most populous state (19.9 million people) in 2014, with the population predicted to reach 21 million by 2020. The increase in residents also results in an increase in traffic volume. The statewide Florida black bear population was estimated to be at least 4,000 bears in 2016, a dramatic increase from estimates as low as 300 bears in the 1970's. While the bear population increase is a conservation success, it also requires attention to avoid posing a danger to motorists as well as bears as they traverse a busy network of roads and highways in search of food and mates.

The Florida Fish and Wildlife Conservation Commission (FWC) works closely with the Florida Department of Transportation (FDOT) to determine the most appropriate locations to install wildlife crossing signs. In 2014, the FWC requested FDOT provide a new set of bear crossing signs as a mitigation measure for areas with high frequencies of vehicle-bear collisions (FWC 2014). As a result, a total of 92 additional crossing signs were installed throughout the state to alert drivers to the increased incidence of bears crossing the roadway at those locations. While measures focused on human behavior are important to reducing collisions, other measures directed at altering the behavior of the bears themselves can significantly increase the effectiveness of mitigation. These measures would focus on design interventions to create safe crossing sites for bears and other wildlife, such as the development of wildlife underpasses.

While the FWC already works with FDOT in long-term planning of road improvements where wildlife crossings can be incorporated into future designs, the FWC has developed this proposal to provide more immediate and cost-effective measures to reduce vehicle-bear collisions and mitigate the resulting risks to motorists and bears. The FWC proposes modification of a select group of existing bridges located near areas with a high frequency of vehicle-bear collisions to serve as possible wildlife underpasses. Modifications could be accomplished with the addition of funnel fencing along roadways and/or wing fencing around bridges to guide wildlife under the roadway, and, if needed, modifying part of the substrate beneath the bridges to encourage wildlife movements.

## **Black Bears and Vehicles**

Collisions with vehicles continue to be the primary cause of death for bears in Florida, with over 230 bears killed annually, accounting for over 80% of known mortality. In addition, vehicle-bear collisions are an increasing threat to motorists and causing injuries and costly damage to vehicles. According to the Florida Highway Patrol, since 2008 there have been more than 10,000 vehicle collisions with animals (at least 10% of which were bears), with a total estimated damage to vehicles and property of more than \$32,000,000. Over 1,800 of these collisions involved injuries to people, with one known fatality attributed to a collision between a motorcyclist and a bear in 2009 on State Road 40.

*\*Florida Fish and Wildlife Conservation Commission (FWC). 2014. High Density Vehicle-Bear Collision Locations and Potential Mitigation Measures. Florida Fish and Wildlife Conservation Commission, Tallahassee, Florida*

This proposal will address potential mitigation efforts within two FDOT Districts (3 and 5) based on the set of bridges deemed suitable for potential wildlife underpasses. These District areas include approximately 80% of the 1,238 vehicle-bear collisions recorded within the state of Florida between 2012 and 2016 (Figure 1).

The statewide Florida black bear population is comprised of seven subpopulations. Four of the seven subpopulations are large and growing, with over 1,000 individual bears in each, including one in Northern Florida that is connected to a large population of bears in Southern Georgia. Although most bear mortalities from vehicle collisions occur in these larger bear subpopulations that can withstand a relatively high mortality rate from vehicles, concerns for public safety and social tolerance remain due to such high numbers of vehicle-bear collisions. Three of the subpopulations are small, with fewer than 200 bears in each, and thus cannot tolerate high levels of mortality without risks to persistence over the long term (Figure 2).

Wildlife underpasses combined with roadside fencing can provide effective mitigation of vehicle-wildlife collisions and allows for genetic exchange within and between subpopulations that may be separated by roadways. The FWC has identified some sections of roadways with a high frequency of vehicle-bear collisions that could be modified to act as wildlife underpasses. Modifying existing bridges along those roadways offers an opportunity to reduce wildlife collisions in a timelier manner and at a much lower cost than specially-designed wildlife underpasses. Modifications would mostly entail the installation of fencing along roadways and/or wing/funnel fencing around the bridges, which physically separates wildlife from roadways and guides wildlife to travel under the bridge.

## **Project Description and Results**

The FWC examined the location of vehicle-bear collisions that occurred between 2012 and 2016 to determine where high-density concentrations, or ‘hotspots’, of collisions were consistently occurring to identify specific areas for potential mitigation measures. The FWC used FDOT bridge data to identify all existing bridges within 100 meters of a hotspot. These 350+ bridges were then examined by FWC staff through aerial imagery and the “street view” function on Google Earth to identify those with the potential to become wildlife underpasses. The FWC reviewed bridge height and width, the substrate under the bridge, and land ownership on both sides of the bridge to determine suitability for potential modification.

To prioritize the potential bridges, the FWC created 3 different kernel density outputs of vehicle-bear collisions, each with a different search radius: 1 km, 5 km, and 10 km. These distances were chosen to effectively display the hotspot analysis at a local, district, and statewide scale. Using these criteria, the 350+ bridges were reviewed and the FWC identified 28 bridges statewide with the potential to act as wildlife underpasses in areas where vehicle-bear collisions are common. Many of the bridges identified are near or within wildlife conservation areas. The FWC classified each of the 28 potential bridges into one of three categories based on priority, including ‘high’, ‘moderate’, and ‘low’ priority levels based on the bridge’s proximity to the 1 km and 5 km hotspot locations throughout the state, as well as some of the factors previously

mentioned. Many of these bridges span small creeks that fluctuate seasonally, providing substrate on which bears could walk rather than swim. While bears are capable of swimming, we assume they would be more likely to cross under a bridge if that was not necessary. The FWC did not conduct on-the-ground assessments of the bridges to determine if bridge structure, substrate, human activity on or under the bridge or other factors may preclude them from modifications.

Five of the bridges were classified as high priority because they are located within or between 1 km hotspot areas with high densities of vehicle-bear collisions (Figure 3). Additionally, 5 of the bridges were classified as moderate priority and 18 were classified as low priority.

Highways can alter bear movement patterns, increase risk of mortality when accessing seasonal foods, prevent access to seasonal foods outright, and limit genetic interchange between bear subpopulations. Strategically placed wildlife underpasses may not only lessen vehicle-bear collisions but can also encourage increased movement and access to habitats as well as interchange among subpopulations.

Modifying fencing at existing bridges located near areas with high densities of vehicle collisions will allow for more immediate measures to reduce vehicle-bear collisions than traditional long-term planning projects. While our focus is to reduce bear deaths caused by vehicles, adding fencing to funnel bears under existing bridges will no doubt benefit many other wildlife species and reduce the risk to public safety posed by wildlife on roads.

While the proposed mitigation techniques cannot prevent all collisions with wildlife, they can significantly reduce the risk that they occur and provide for improved public safety and wildlife conservation.

**Table 1:** Summary of bridges that could be modified to be wildlife underpasses (n = 28)

FDOT District	Priority Level	Street Name	County	Latitude	Longitude
3	High	US-319 (Yent Bayou Bridge)	Franklin	29.789627	-84.764758
3	High	W US-98	Gulf	29.872033	-85.339269
3	High	Blountstown Highway	Leon	30.413724	-84.551635
3	High	Blountstown Highway	Leon	30.430497	-84.529583
3	Moderate	E Highway 22	Bay	30.140916	-85.407084
3	Moderate	US-319 (Sopchoppy Highway)	Wakulla	30.068973	-84.451431
3	Moderate	CR 259 (Waukeenah Highway)	Jefferson	30.446315	-83.94147
3	Moderate	I-10	Jefferson	30.472911	-83.853264
3	Low	Harvey Mill Road	Wakulla	30.165622	-84.394333
3	Low	Old Bicycle Road	Bay	30.137784	-85.541323
3	Low	US-231/SR 75	Bay	30.320148	-85.456179
3	Low	US-319/SR 369 (Crawfordville Road)	Leon	30.357695	-84.302786
3	Low	Scotts Ferry Road	Bay	30.351293	-85.409617
3	Low	CR-368	Liberty	30.17686	-84.671312
3	Low	SE FH 13	Liberty	30.177494	-84.680995
3	Low	Oak Ridge Road W	Leon	30.323741	-84.301946
3	Low	CR 257 (S Salt Road)	Jefferson	30.392704	-83.811138
3	Low	US-319/SR 263 (Capital Circle SW)	Leon	30.387513	-84.313262
3	Low	Gainer Road	Bay	30.400749	-85.525389
3	Low	Good Morning Street	Gulf	29.862464	-85.337656
5	High	SR-44	Lake	28.874604	-81.489356
5	Moderate	SR-40	Volusia	29.226621	-81.3116
5	Low	W International Speedway Blvd.	Volusia	29.054561	-81.311229
5	Low	Tomoka Farms Road	Volusia	29.072937	-81.068142
5	Low	Taylor Road	Volusia	29.084017	-81.064881
5	Low	LPGA Blvd.	Volusia	29.2172	-81.109475
5	Low	CR-316	Marion	29.37207	-81.895556
5	Low	I-95	Volusia	29.090951	-81.020449

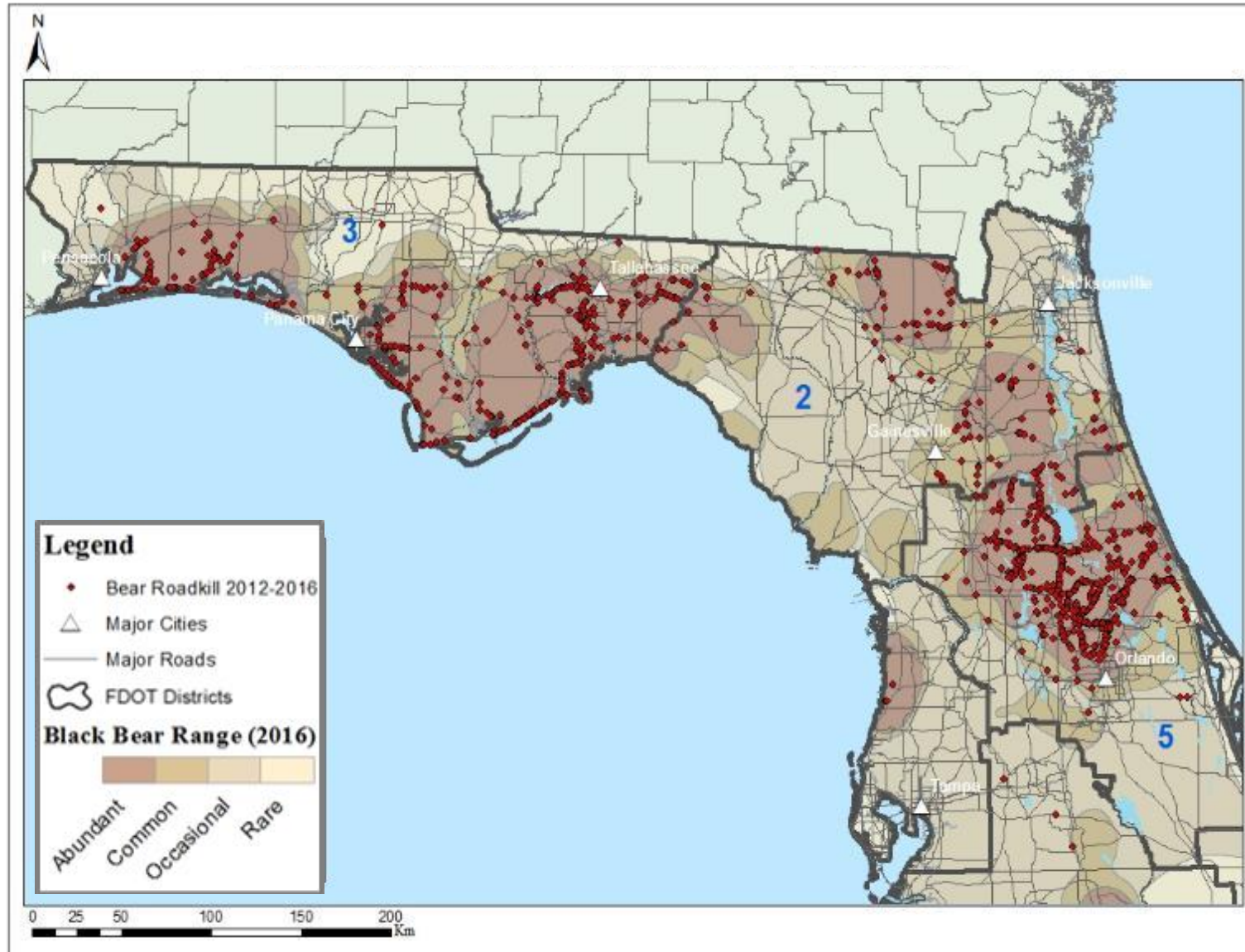
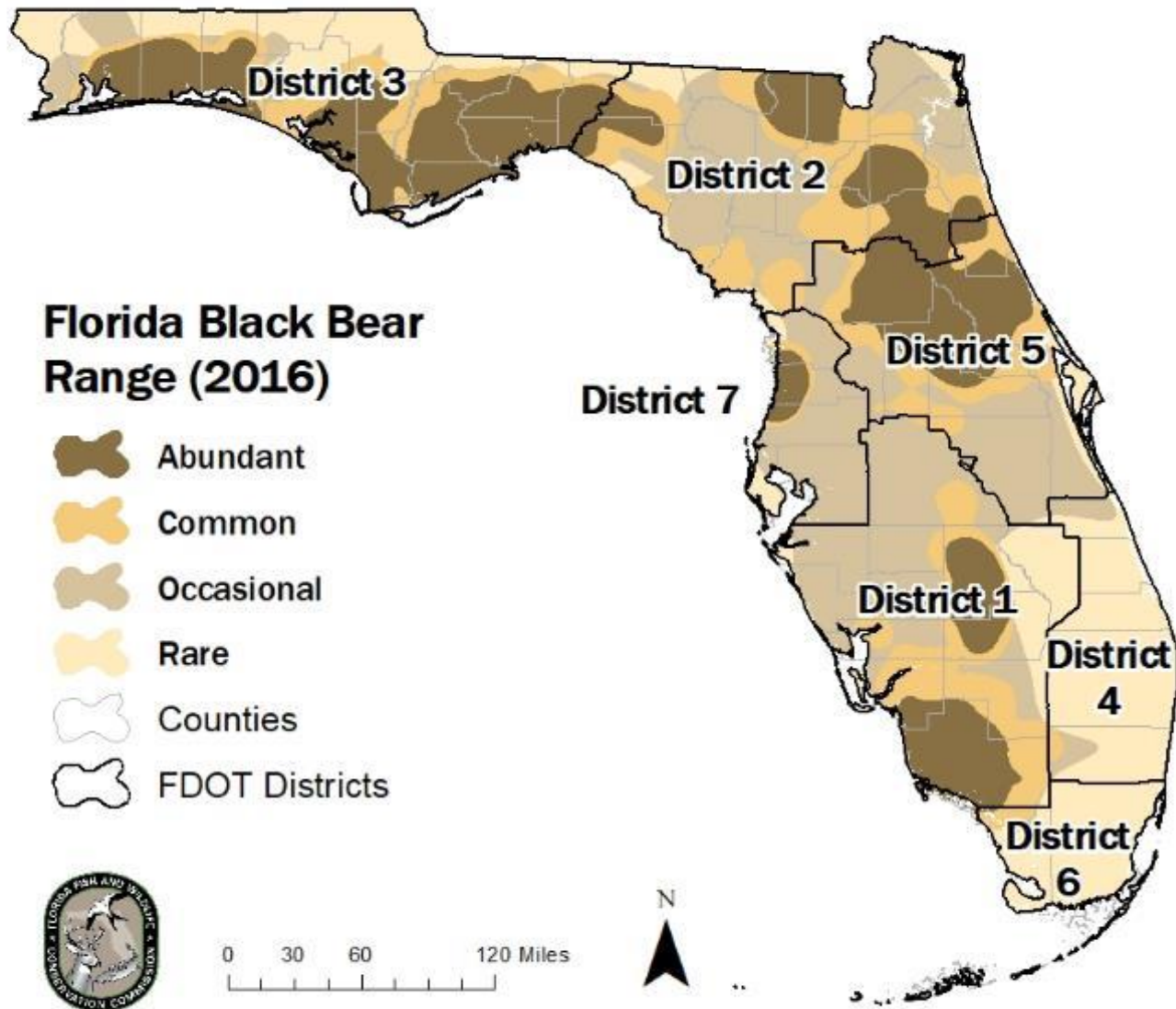
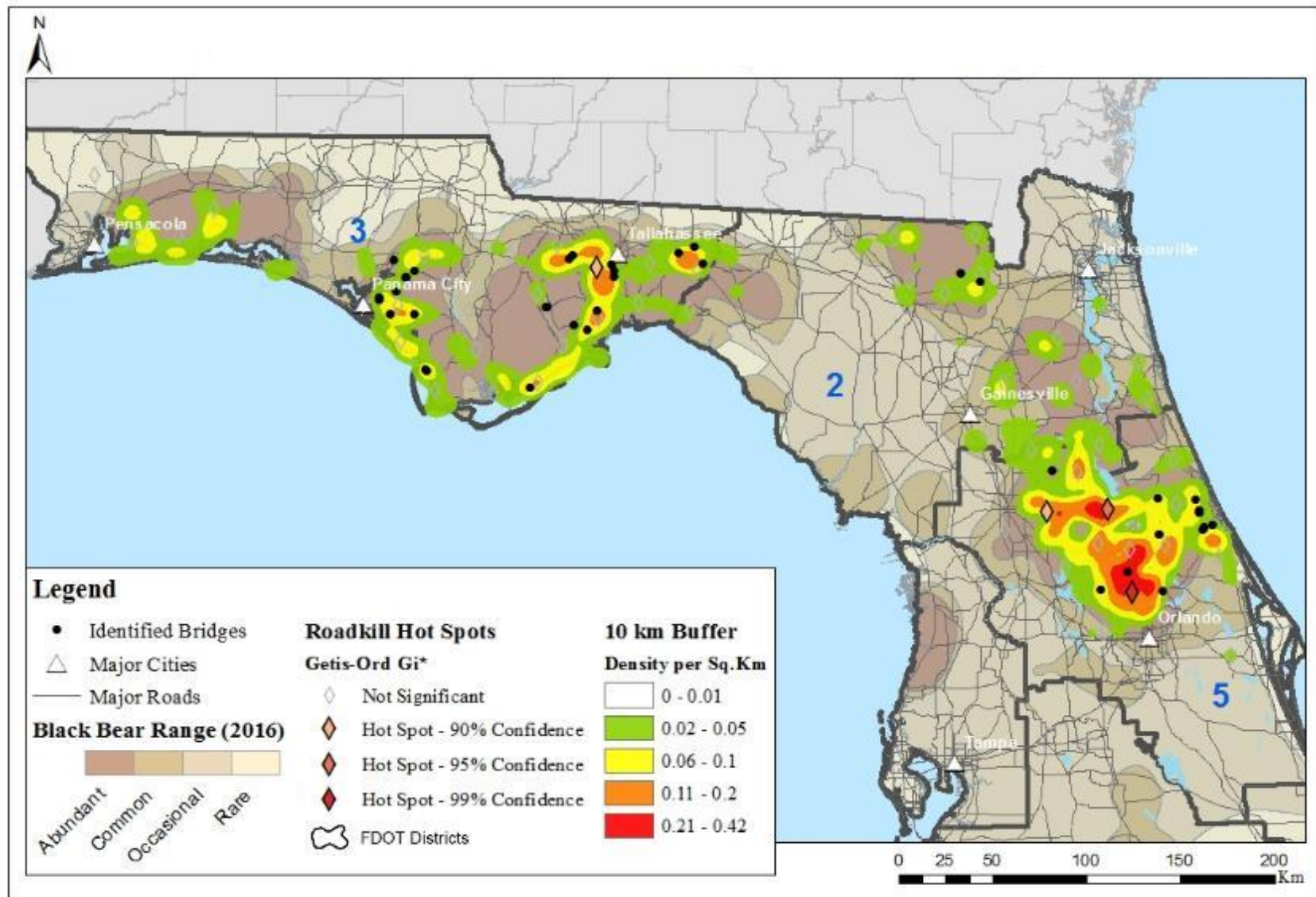


Figure 1: Vehicle-bear collision locations between 2012 and 2016 in FDOT Districts 3, 2, and 5.



*Figure 2:* Florida black bear range and Florida Department of Transportation (FDOT) District boundaries.



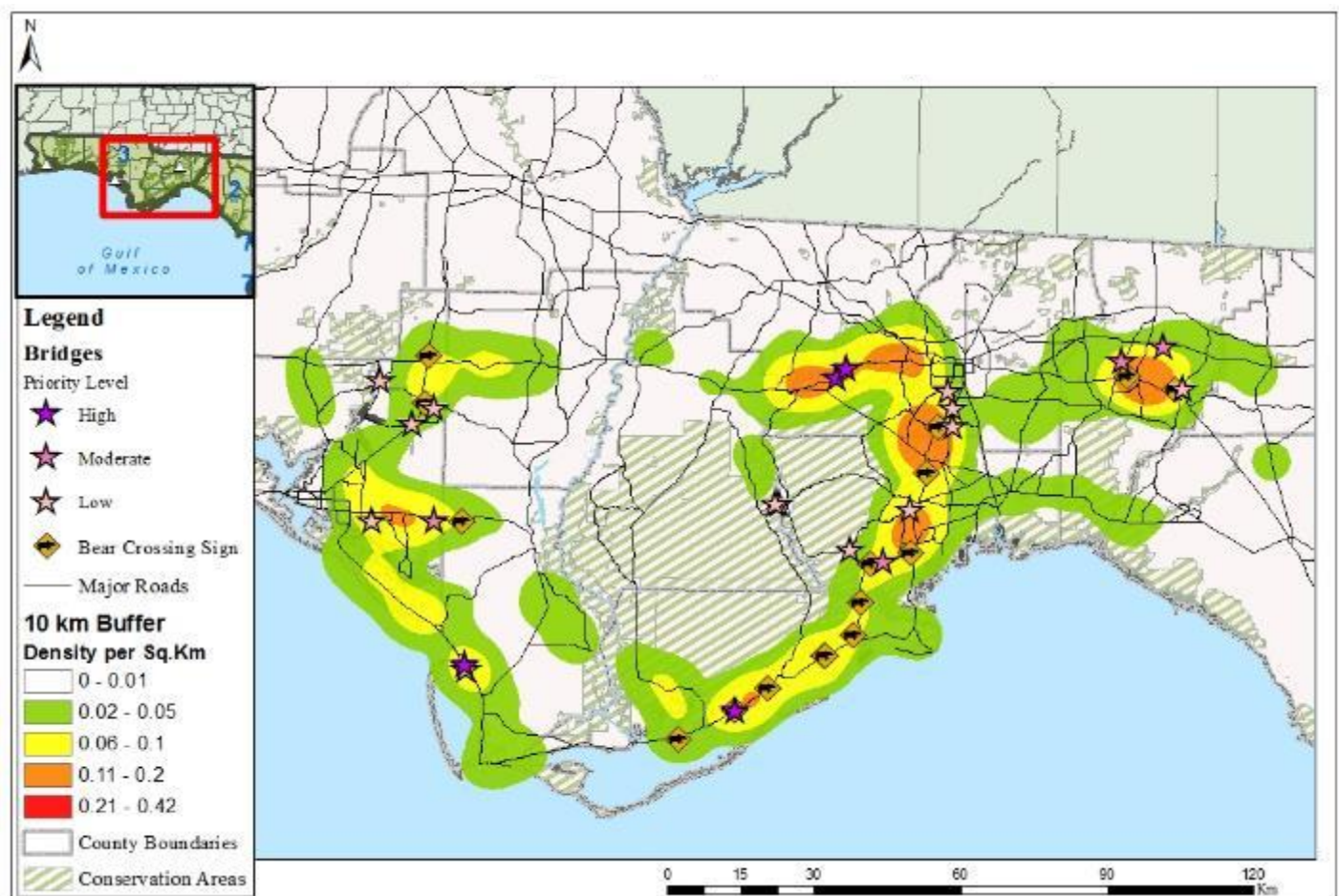


**Figure 3:** High density locations of Florida vehicle-bear collisions (2012 – 2016) in FDOT Districts 3, 2, and 5.

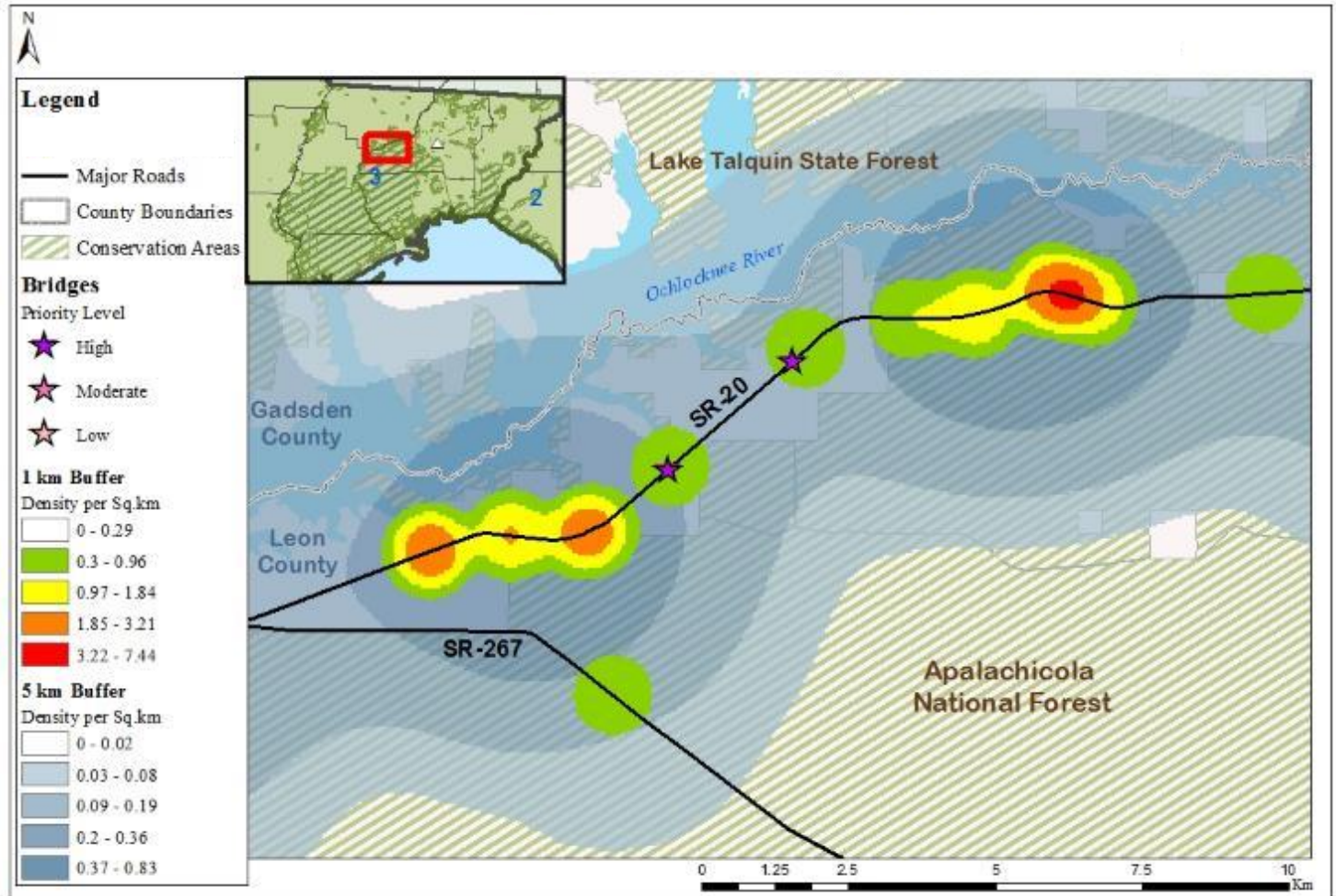


## District 3

FDOT District 3 encompasses the Panhandle area of Florida, and it includes large areas of conservation land which support Florida black bears. The area included in this proposal focuses on the subpopulation in and around the Apalachicola National Forest, which is estimated at 1,060 bears. This District accounts for 33% of the statewide vehicle-bear collisions between 2012 and 2016 and contains most of the bridges identified as potential wildlife underpasses in this analysis. The FWC identified a total of 20 bridges in District 3: four ranked as high, four ranked as moderate, and 12 ranked as low priority (Figure 4). While we request FDOT consider all 20 bridges identified, we recommend the four high priority bridges are the best candidates for modification at this time.

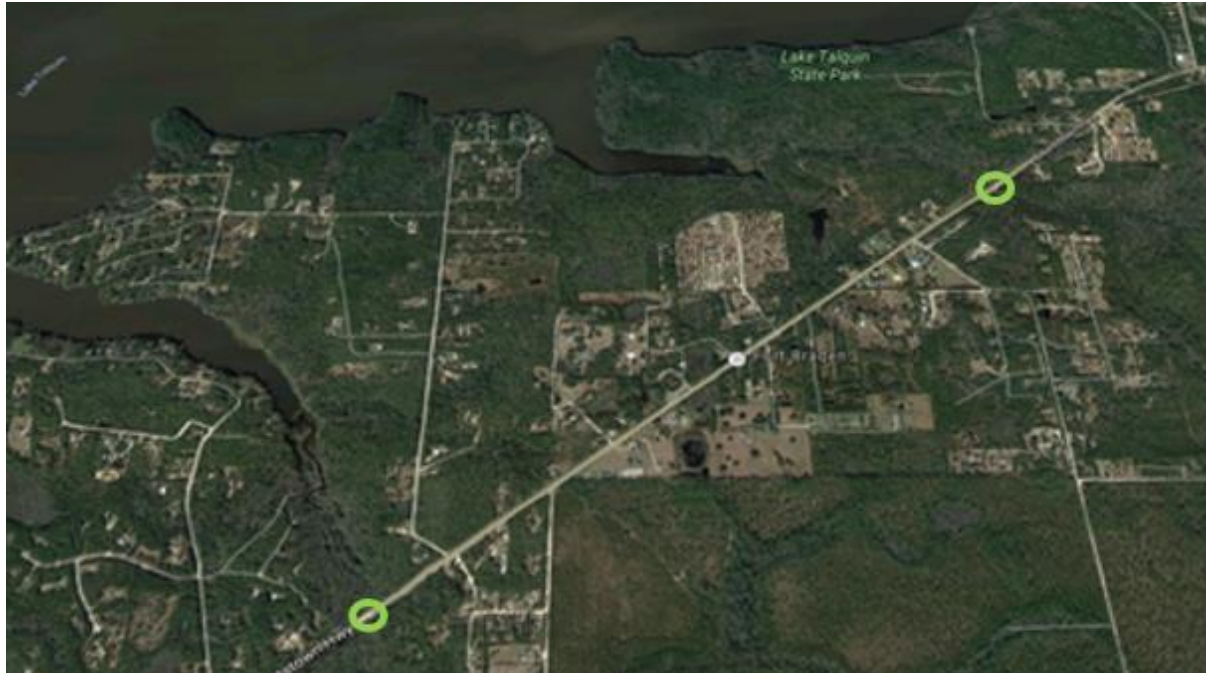


**Figure 4:** High density locations of vehicle-bear collisions in FDOT District 3.



**Figure 5:** High density locations of vehicle-bear collisions in the Leon County portion of the FDOT District 3.

The Blountstown Highway bridges are located between two major hotspots (Figures 5-8). A total of 18 bears have been killed due to vehicle collisions within this 15 km section of road between 2012 and 2016. This section of road is an excellent candidate for fencing to encourage bears and other wildlife to cross under these two bridges. The potential wildlife underpass locations are bordered by the Apalachicola National Forest, Joe Budd Wildlife Management Area, and the Lake Talquin State Forest.



**Figure 6:** Aerial imagery of a section of Blountstown Highway showing two bridge locations in Leon County in FDOT District 3.





**Figure 7:** Aerial imagery of a section of Blountstown Highway showing the northern bridge location in Leon County in FDOT District 3.



**Figure 8:** Aerial imagery of a section of Blountstown Highway showing the southern bridge location in Leon County in FDOT District 3.

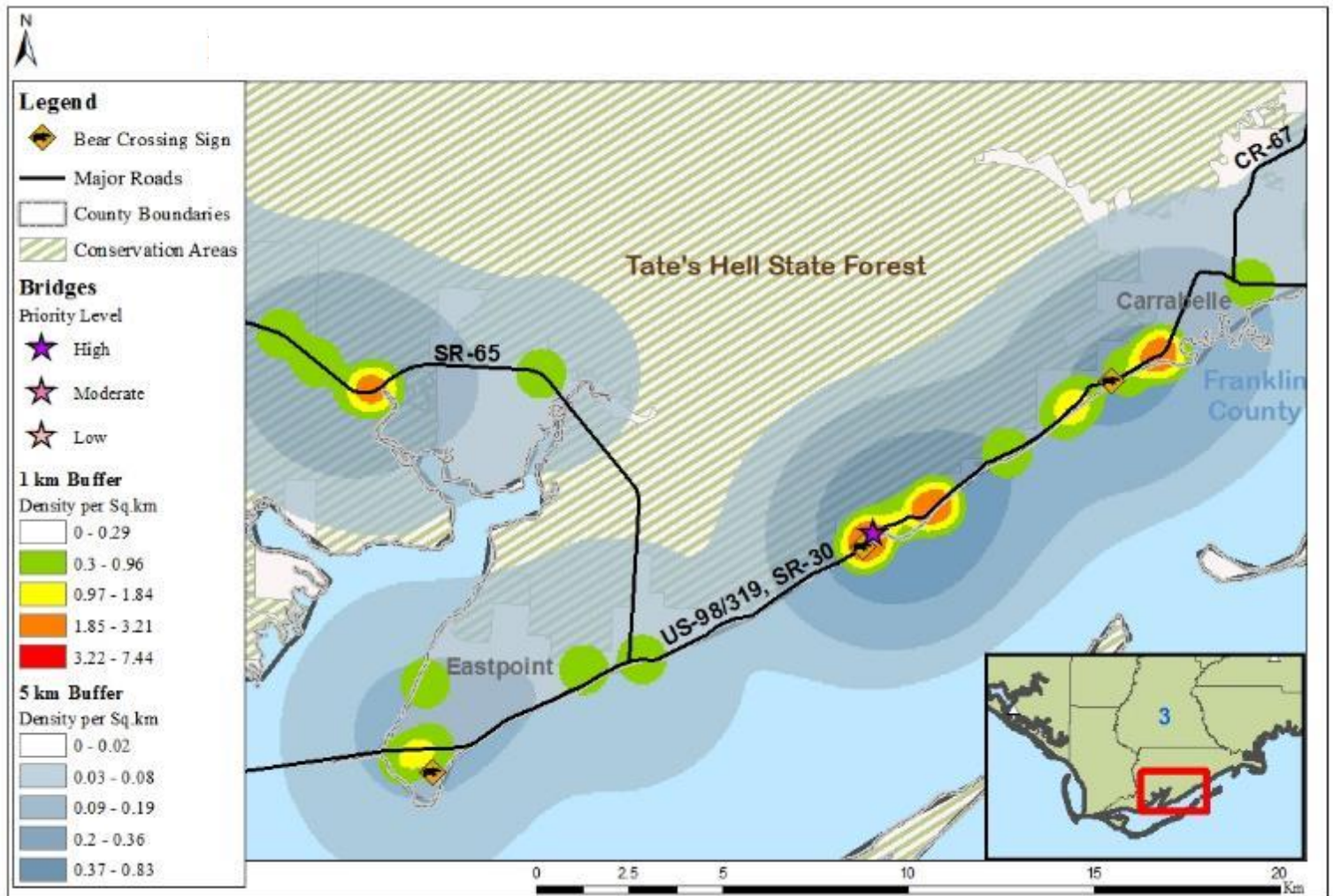


Figure 9: High density locations of vehicle-bear collisions in the Franklin County portion of the FDOT District 3.

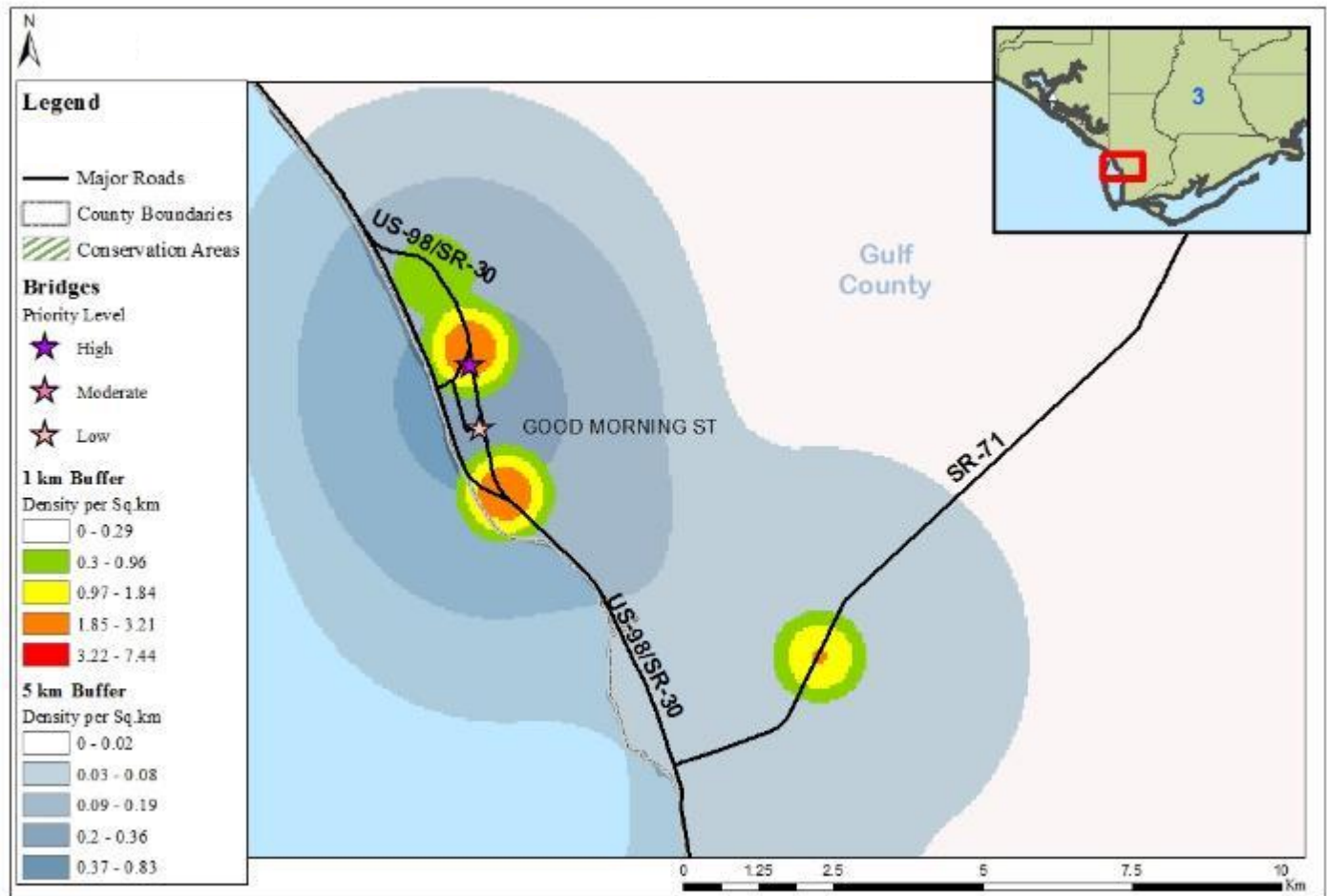


The Yent Bayou Bridge (on US-98) has been identified as one of the four high priority locations in District 3 (Figures 9-10). The bridge is located directly on a 1 km hotspot and is near an existing bear crossing sign. Eight bears were killed in this location between 2012 and 2016. One side of the road is bordered by Tate's Hell State Forest.



**Figure 10:** Aerial imagery of a section of US Highway 98 showing the Yent Bayou bridge location in Franklin County in FDOT District 3.



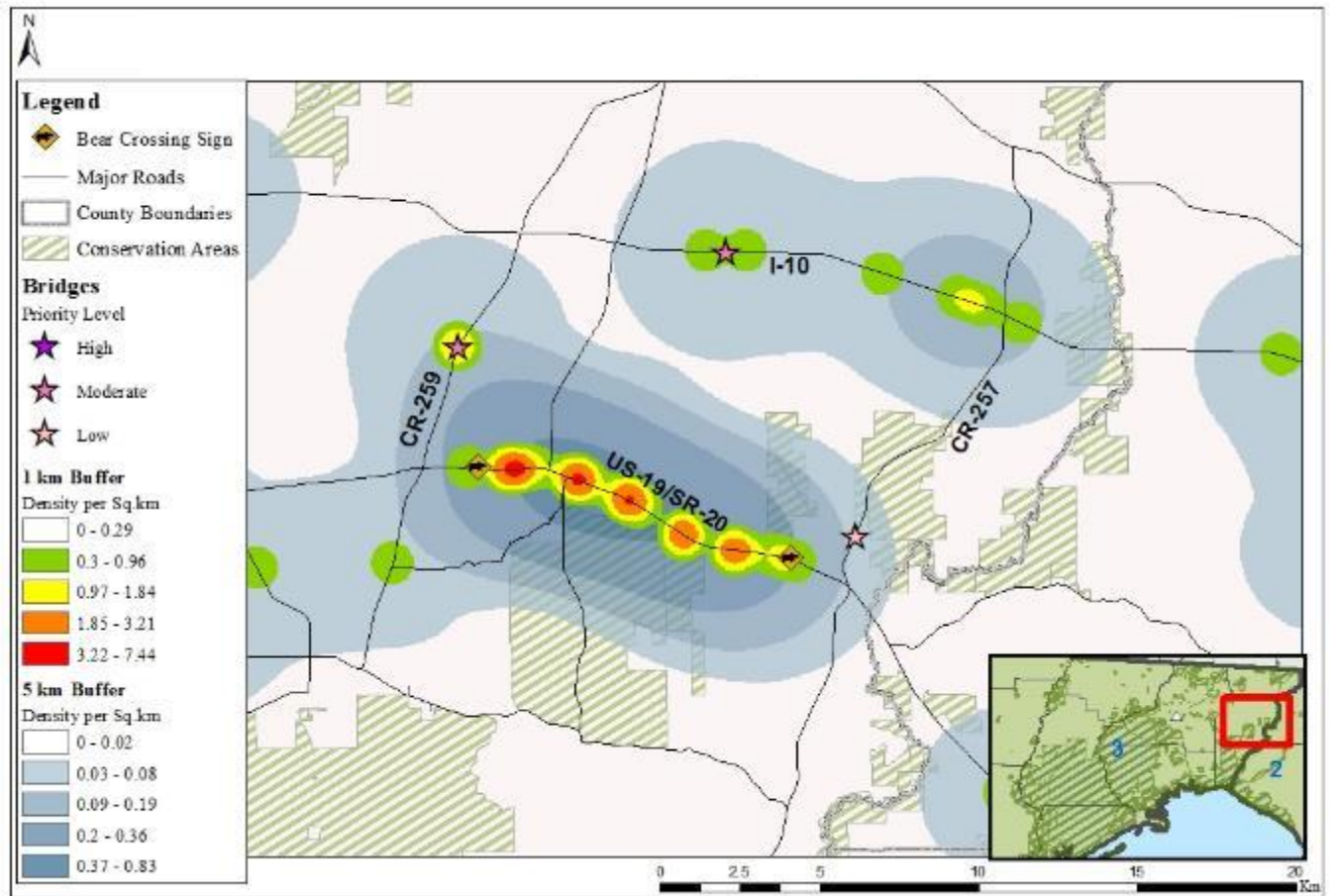


**Figure 11:** High density locations of vehicle-bear collisions in the Gulf County portion of the FDOT District 3.

Another high priority bridge in District 3 is located along the coast in Gulf County on US Highway 98 (Figures 11-12). The bridge is located within a 1 km hotspot for vehicle-bear collisions. A low priority bridge is located on Good Morning Street. However, the primary concern for modifying those bridges is the lack of publicly managed conservation areas in the immediate vicinity.



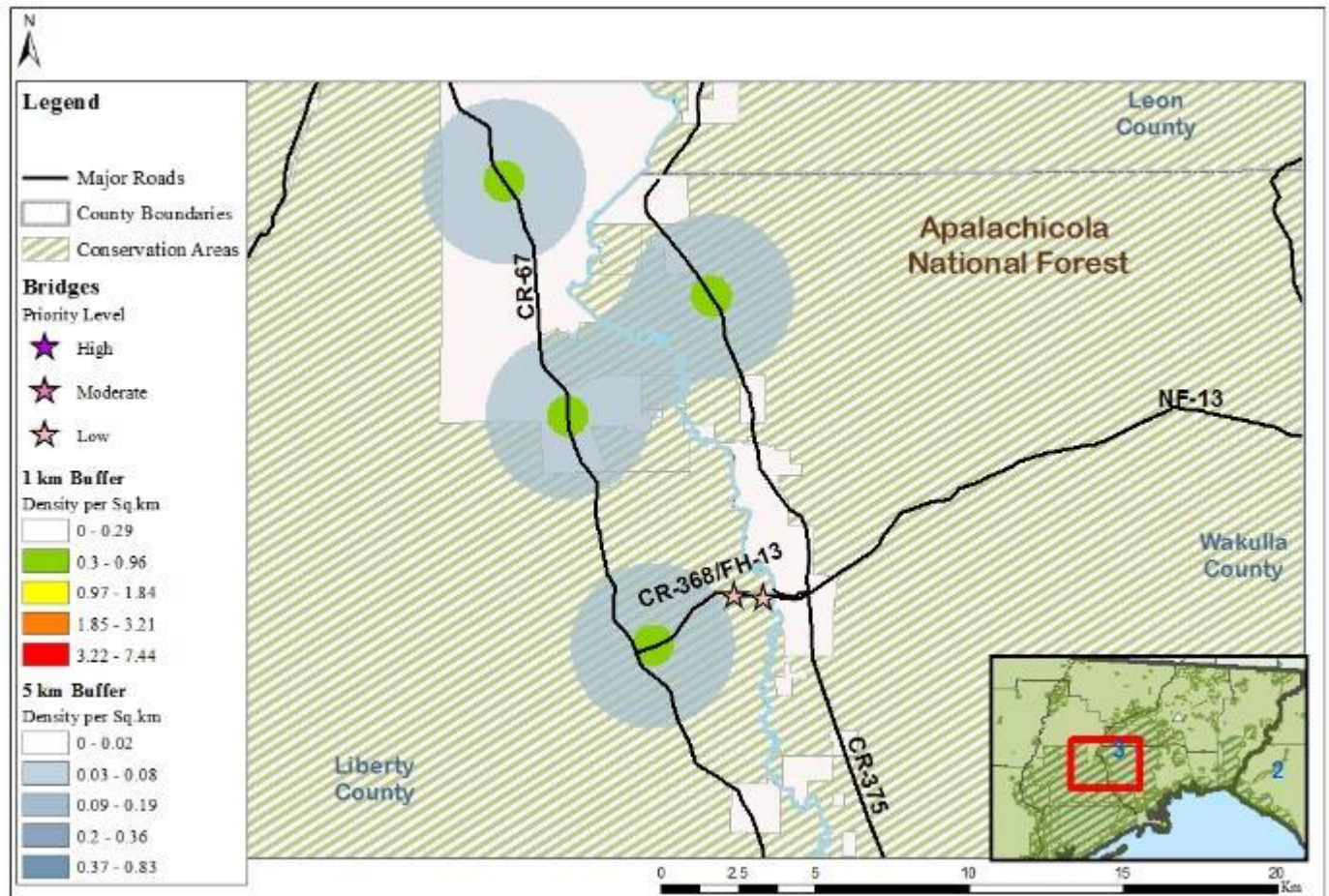
**Figure 12:** Aerial imagery of the high priority bridge on US Highway 98 in Gulf County in FDOT District 3.



**Figure 13:** High density locations of vehicle-bear collisions in the Jefferson County portion of the FDOT District 3.

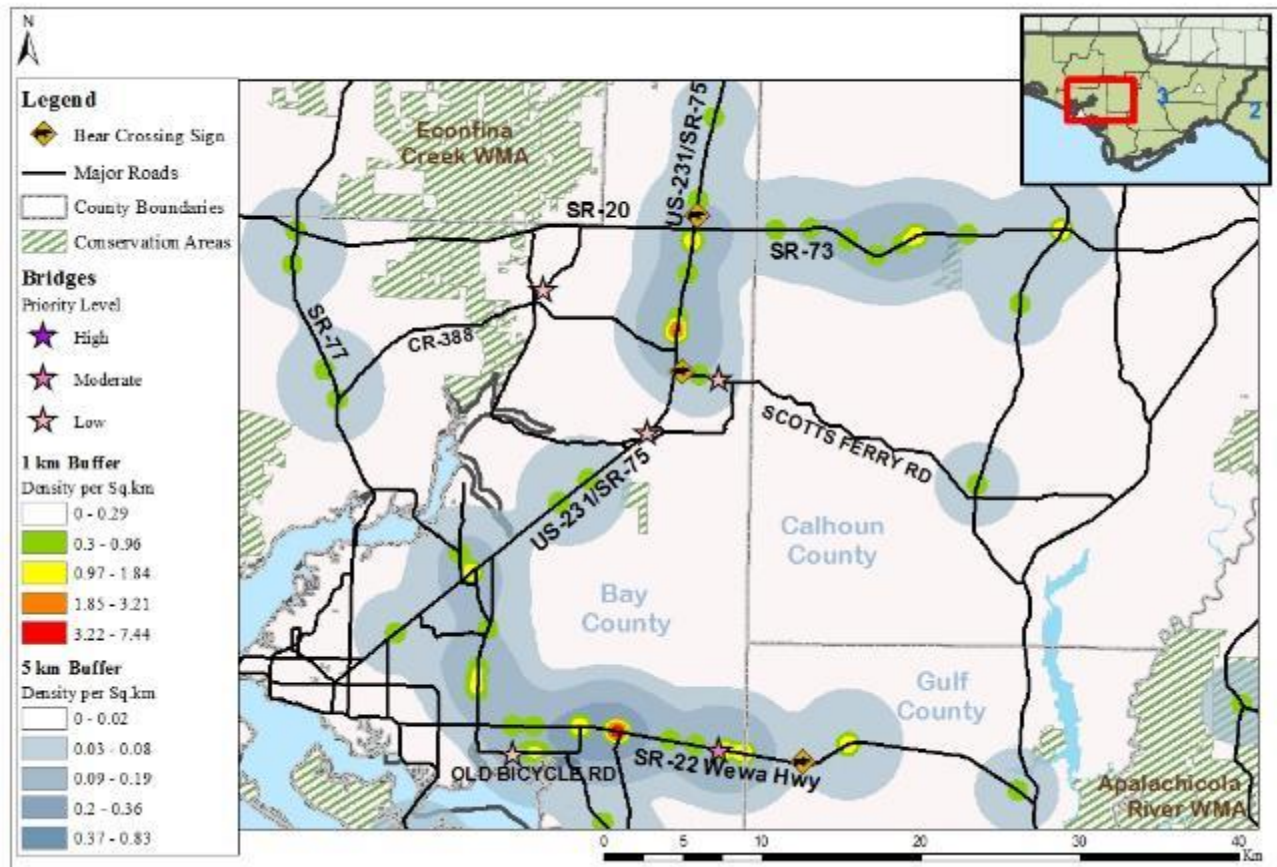
The FWC identified a particularly challenging 8-mile section of US Highway 19/State Road 20 (Figure 13). Unfortunately, none of the bridges identified around this hotspot were located on this stretch of highway. In this situation, it would be ideal to incorporate a wildlife underpass along this stretch of road during any future road improvement projects. There are two moderate priority bridges on County Road 259 and Interstate 10, but they may not be appropriate for fencing. While the low priority bridge located on County Road 257 would likely make for a reasonable underpass for wildlife due to design, the location is not in close enough proximity to the hotspots on US 19/State Road 20 to likely make much of an impact on reducing collisions.





**Figure 14:** High density locations of vehicle-bear collisions in the Liberty County portion of the FDOT District 3.

There are two low priority bridges located on County Road 368/Forest Highway 13 in the Apalachicola National Forest that are near low density hotspots for vehicle-bear collisions (Figure 14). Based on the number of vehicle-bear collisions and traffic volume, we would defer to FDOT's preference as to whether modifications would be appropriate here, or if resources would be better used elsewhere for fencing on higher priority locations.



**Figure 15:** High density locations of vehicle-bear collisions in the Panama City area of the FDOT District 3.

There are several low-density hotspots in the Panama City area of Bay County in District 3 (Figure 15). A low priority bridge on Old Bicycle Road could be an ideal modification as a potential wildlife underpass because the existing guardrails on either side of the road leading to the bridge could be replaced with wildlife fencing (Figure 16). However, we recognize that this is not a state-maintained road, and therefore may not be as high a priority for FDOT as other state-maintained roads in the district.





**Figure 16:** Aerial imagery of a section of Old Bicycle Road in the Panama City area in FDOT District 3.



A moderate priority hotspot located on State Road 22 and a low priority on Gainer Road also have guardrails along the approach of the bridge on either side (Figures 17-18).



**Figure 17:** Aerial imagery of a section of State Road 22 in the Panama City area in FDOT District 3.



**Figure 18:** Aerial imagery of a section of Gainer Road in the Panama City area in FDOT District 3.



Another low priority bridge is located on Scotts Ferry Road (Figure 19). The bridge is located along a large curve in the road that obstructs a driver's view, which creates a higher probability for vehicle-bear collisions.



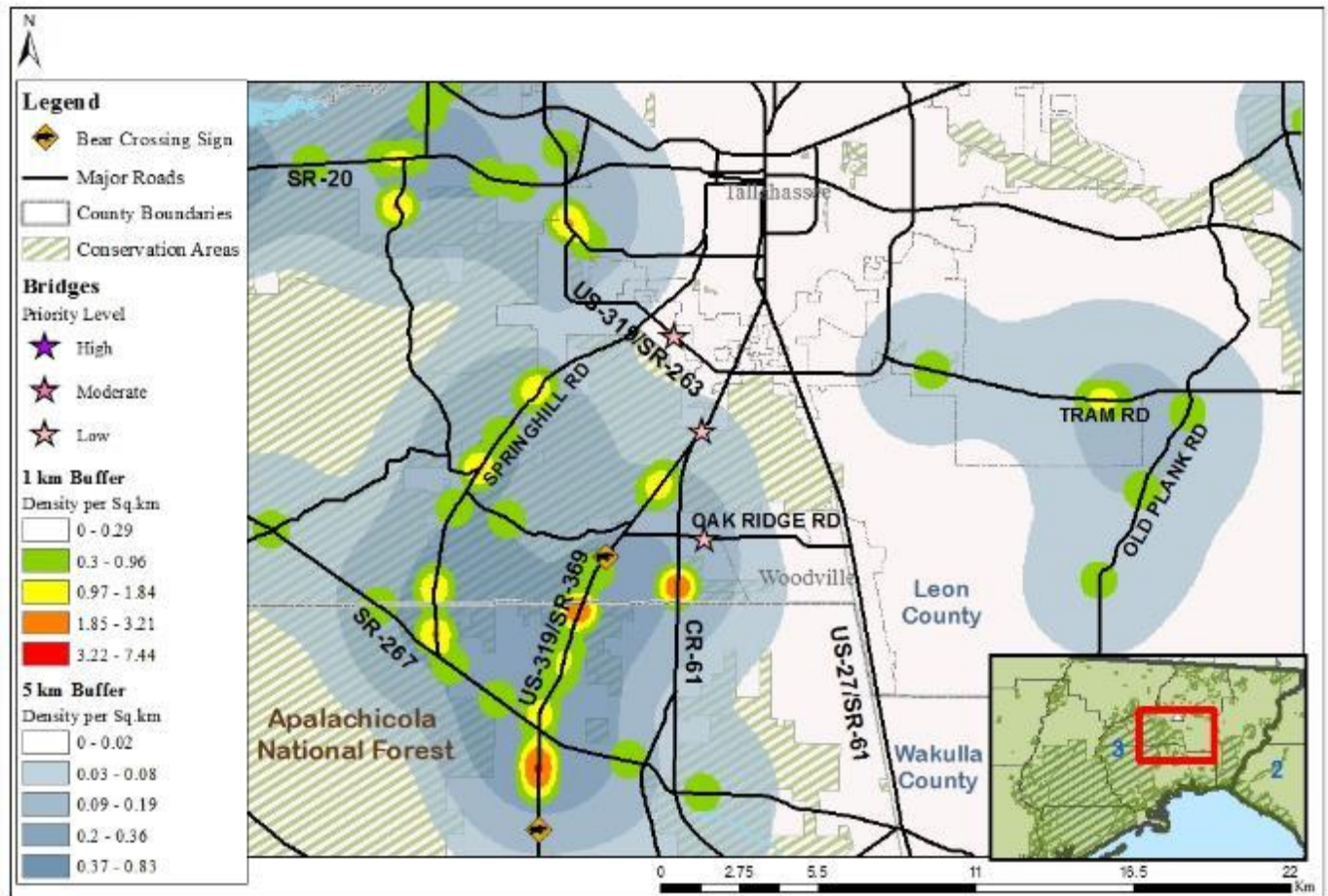
**Figure 19:** Aerial imagery of a section of Scotts Ferry Road in the Panama City area in FDOT District 3.

The last low priority area in FDOT District 3 is on US 231/State Road 75 (Figure 20). While there are not numerous vehicle-bear collisions at this location, adding fencing might assist animals to cross the large roadway and reduce the hotspots just southwest of the bridge.



**Figure 20:** Aerial imagery of a section of US 231/State Road 75 in the Panama City area in FDOT District 3.





**Figure 21:** High density locations of vehicle-bear collisions in the Leon County area of the FDOT District 3.

The remaining three bridges in Leon County have been classified as low priority bridges (Figure 21). The bridges along Oak Ridge Road and US 319/State Road 263 are in proximity to private property (Figures 22-23). The bridge along US 319/State Road 369 has residential parcels on either side (Figure 24). Therefore, modifications for those bridges may not be appropriate.



**Figure 22:** Aerial imagery of a section of US 319/State Road 263 in Leon County in FDOT District 3.



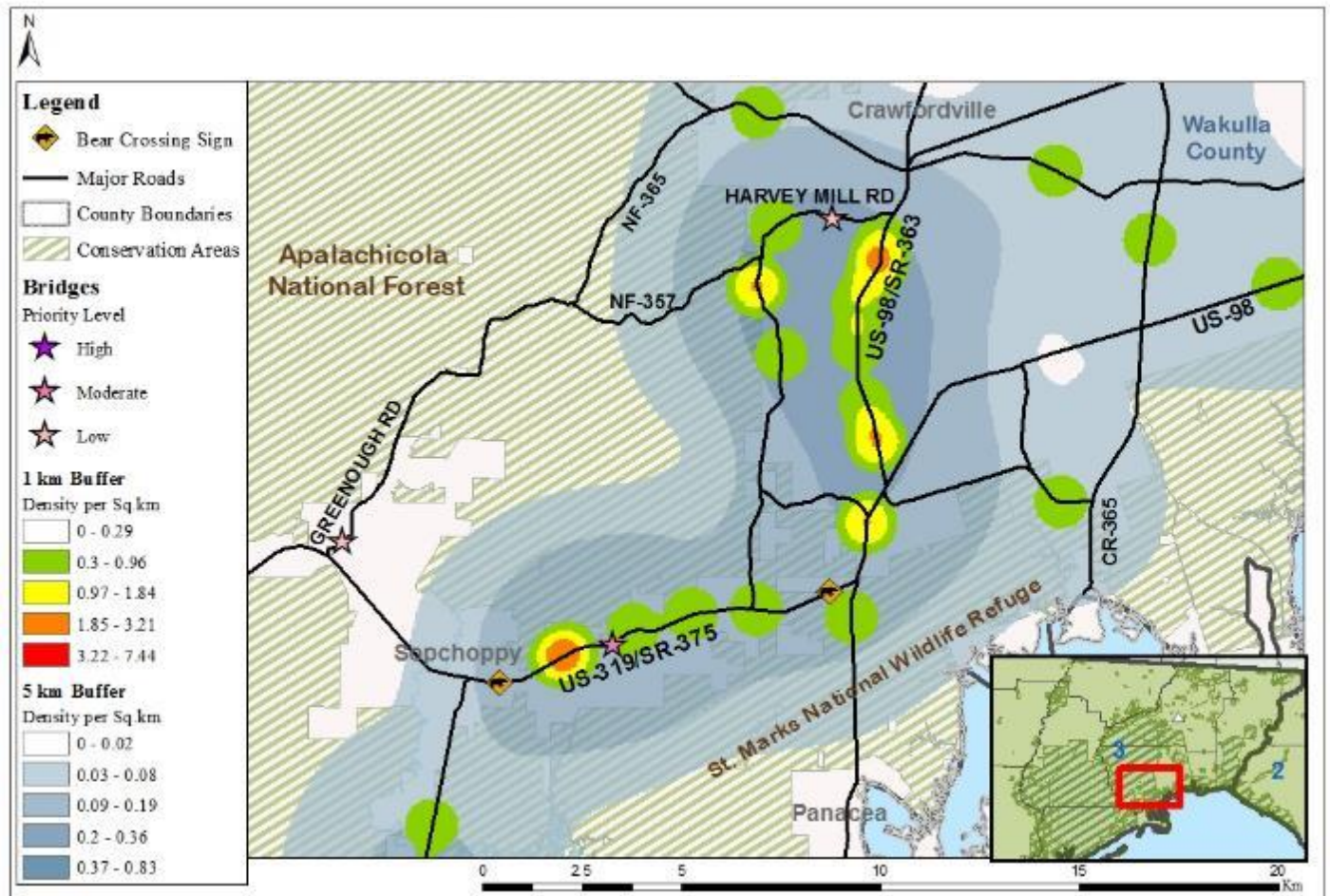


**Figure 23:** Aerial imagery of a section of Oak Ridge Road in Leon County in FDOT District 3.



**Figure 24:** Aerial imagery of a section of US 319/State Road 369 in Leon County in FDOT District 3.





**Figure 25:** High density locations of vehicle-bear collisions in the Wakulla County portion of the FDOT District 3.

A low priority bridge is located along Harvey Mill Road (Figures 25-26). A moderate priority bridge is located on US Highway 319 in the Apalachicola National Forest in Wakulla County (Figure 27). There are several hotspots along a 6-mile section of road, with a total of 13 known vehicle-bear collisions between 2012 and 2016. However, land ownership on either side of the bridge would need to be investigated further if modification were to occur.



**Figure 26:** Aerial imagery of a section of Harvey Mill Road in Wakulla County in FDOT District 3.

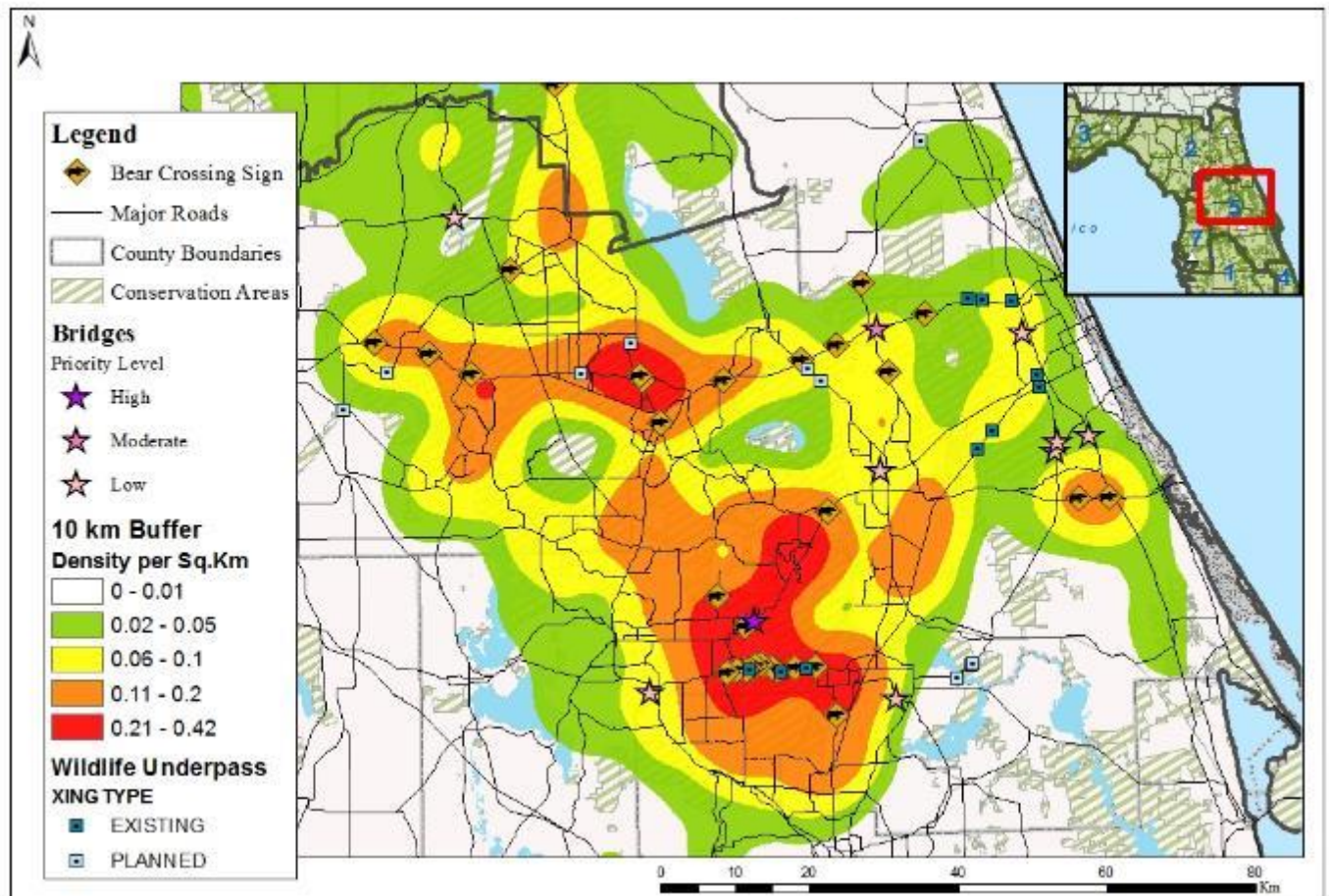




**Figure 27:** Aerial imagery of a section of US 319 in Wakulla County in FDOT District 3.

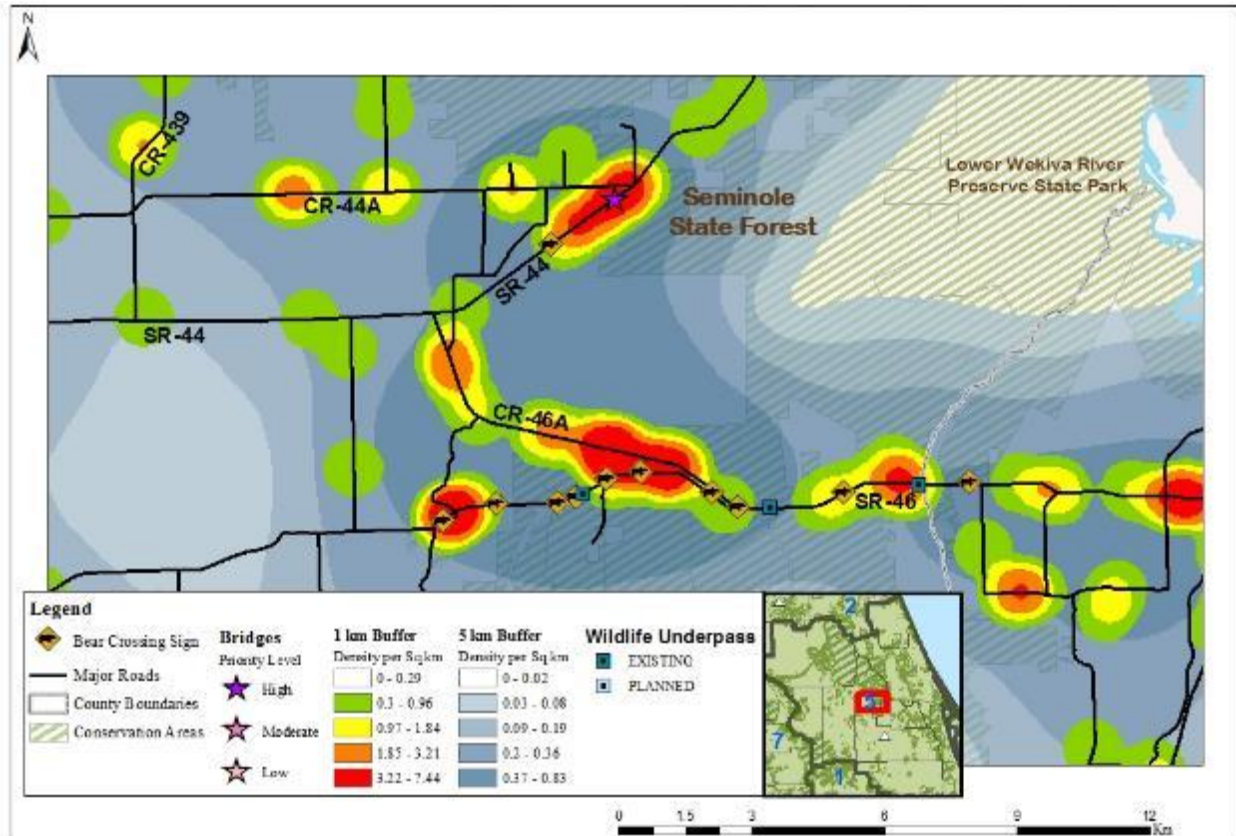
## District 5

FDOT District 5 encompasses the largest subpopulation of Florida black bears, estimated around 1,200 individuals. The high density of bears and proximity to large urbanized areas such as Orlando, make this a hotspot area for vehicle-bear collisions. Between 2012 and 2016, 47% of the statewide vehicle-bear collisions occurred in this District (Figure 28). A total of 8 bridges were identified for potential modification to be wildlife underpasses. One of the District 5 bridges was ranked high priority, one was ranked moderate, and the remaining six were ranked low.



**Figure 28:** High density locations of vehicle-bear collisions in FDOT District 5.



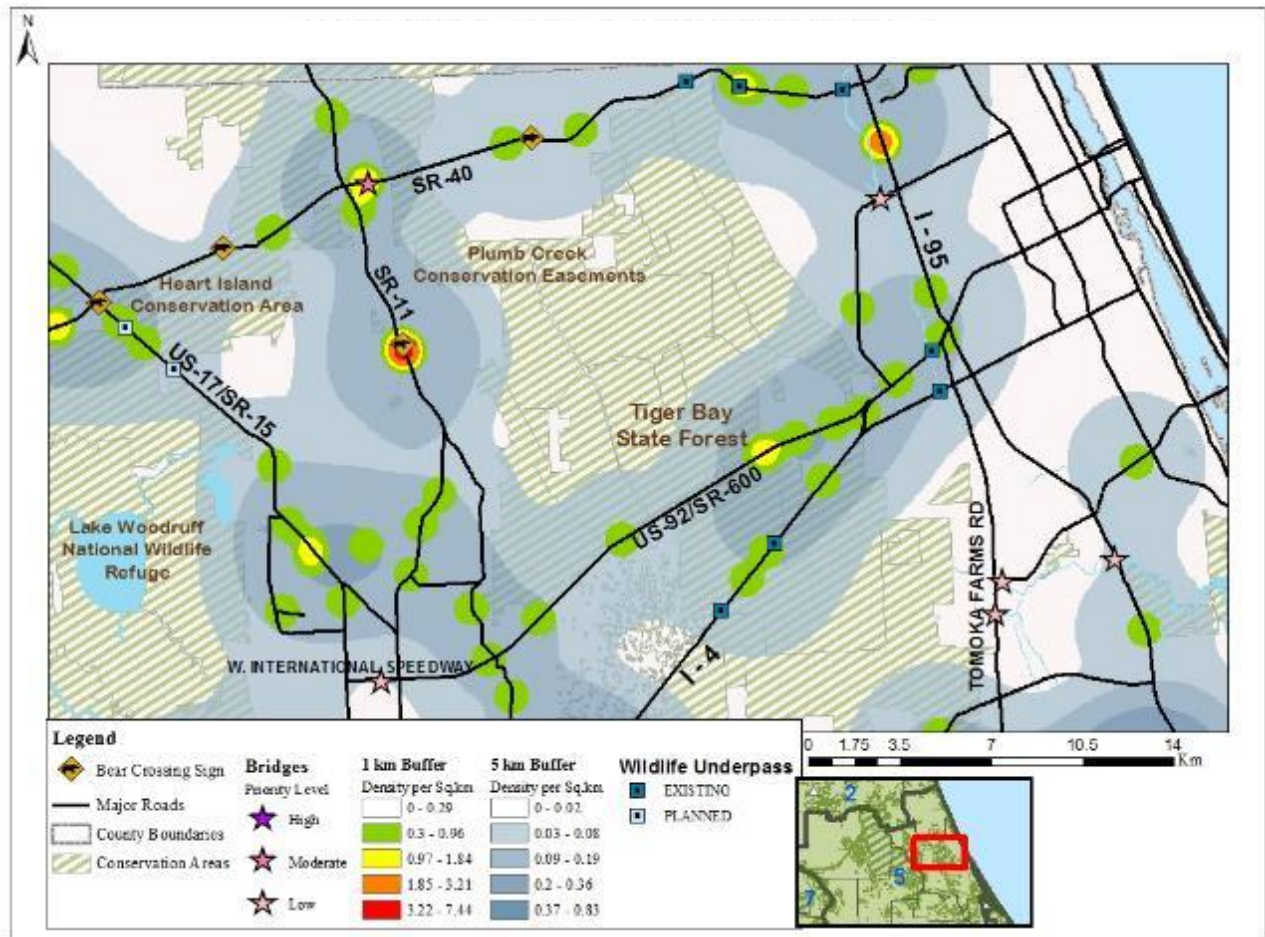


**Figure 29:** High density locations of vehicle-bear collisions in the Lake County portion of the FDOT District 5.

The FWC identified a high priority bridge on State Road 44 (Figures 29-30). A total of 11 bears were hit and killed in the relatively short section of road surrounding the bridge between 2012 and 2016, indicating it may be travel corridor between two sections of the Seminole State Forest. Because of the high frequency of collisions and the location along the edges of public conservation lands, this bridge is an ideal candidate for modification to fencing to make it a wildlife underpass.



**Figure 30:** Aerial imagery of a section of State Road 44 in Seminole State Forest in Lake County in FDOT District 5.



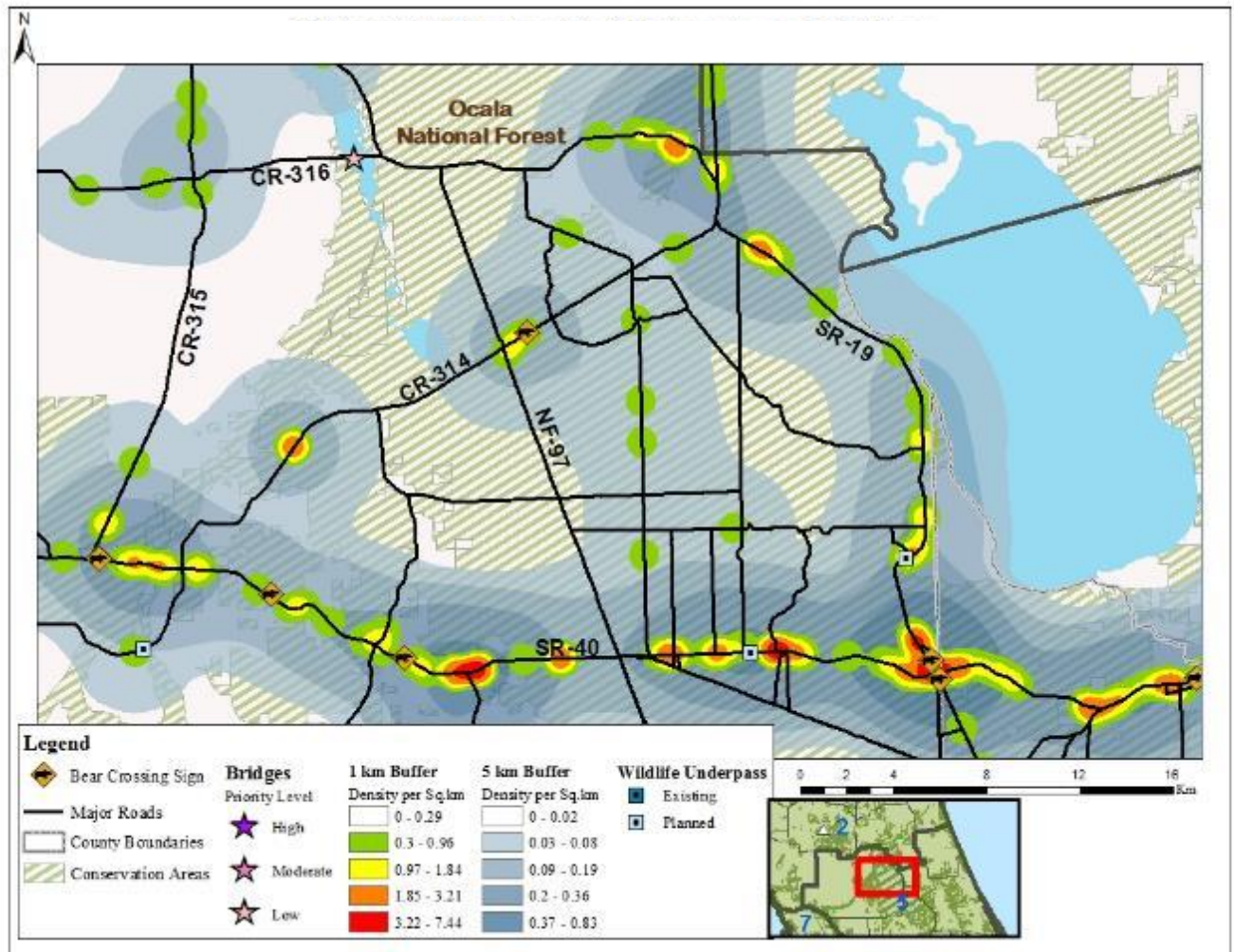
**Figure 31:** High density locations of vehicle-bear collisions in the Volusia County portion of the FDOT District 5.

The moderate priority bridge on State Road-40 (Figures 31-32) is located directly on a 1 km hotspot where three vehicle-bear collisions occurred between 2012 and 2016. The remaining five bridges shown (I-95, Tomoka Farms Road, Taylor Road, LPGA Blvd., and International Speedway) are low priority, as they do not overlap with any significant hotspots.



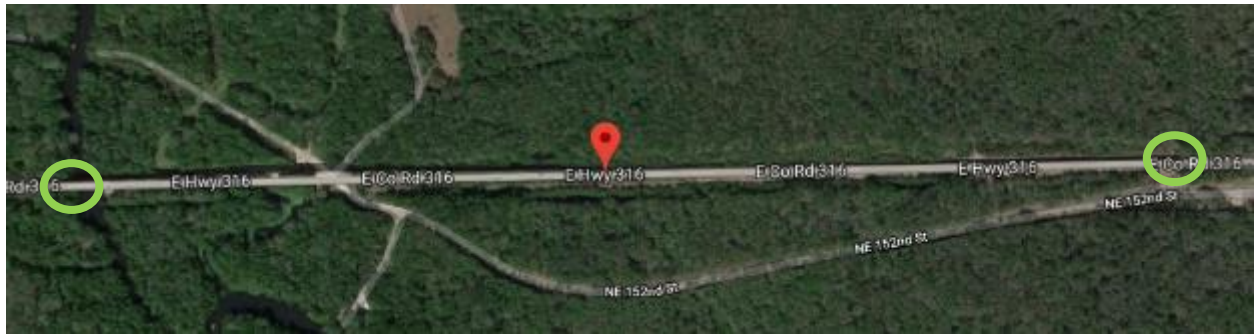


**Figure 32:** Aerial imagery of a section of State Road 40 in Volusia County in FDOT District 5.



**Figure 33:** High density locations of vehicle-bear collisions in the Marion County portion of the FDOT District 5.

While we classified a bridge on County Road 316 as low priority based on its location outside of the 1 km and 5 km hotspots (Figures 33-34), it is located within the densest and most abundant bear population in Florida. The property is part of the Ocala National Forest on both sides, so fencing this bridge would be a beneficial, proactive approach to avoid future vehicle-bear collisions in anticipation of increasing traffic with the growing human and bear population in this area.



**Figure 34:**

Aerial imagery of a section of County Road 316 in Marion County in FDOT District 5.